# Art. V.—*A Geologist's Notes on Water-Divining.*

By GRIFFITH TAYLOR, D.Sc., B.E., BA.

(With Plate IV. and two Text Figures).

[Read July 8th, 1920].

In view of the widespread belief in Australia in the powers of the Water Diviner, the following personal experiences (followed by the authoritative opinions of others) should be of interest to members:—

On a recent visit to the Federal Capital Territory, I devoted several days to the question of water supply for the repatriated soldiers in the valley between the Ainslie-Majura ridge and the Black Mountain ridge.

The *general geology* is simple. The valley runs north and south, and consists essentially of Silurian shales and clay-slates covered by a variable thickness of recent alluvial. These shales are flanked on the west by the harder sandstones and quartzites of Black Mountain, which form a ridge about 800 feet above the plain. (See Text Figs. 1 and 2.)

On the east is a ridge of hard porphyry or tuff. These eruptive rocks are probably later than the sedimentary shales and sandstones. This porphyry constitutes Mount Ainslie and Mount Majura. The line of junction between the porphyry and the shale runs north and south except for a spur of porphyry, which forms the low ridge at Ainslie Post Office. These features are shown in a general fashion in the coloured map by D. J. Mahony and myself. (Report of Geological Reconnaissance, 1913.)

There is nothing unusual in the conditions in the Ainslie Valley, save perhaps that the unbroken rampart of hard rocks (see contours on figure 1) on each side indicates that the water supply will be fairly reliable if ordinary geological precautions are taken in sinking wells.

Here, as everywhere, a large portion of the water sinks underground through the porous surface soils, debris, gravel, talus and alluvium generally, until it reaches the solid impervious rock beneath. Both the formations here represented are of an impermeable nature, i.e., the solid shales and solid porphyry.

The water, on reaching this region, forms a more or less con-

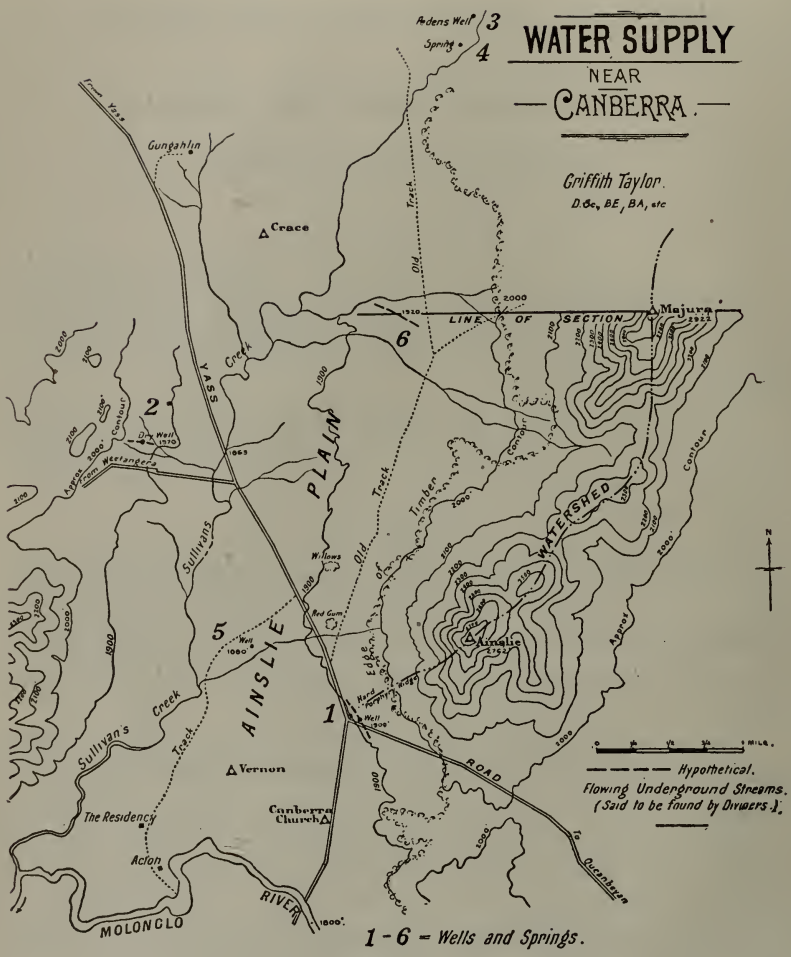
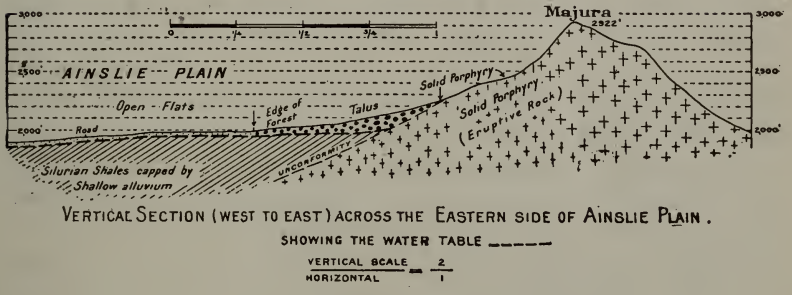



FIG. 1.

tinuous sheet. Every filament of this sheet is always moving down the steepest grade. The *water-table* (see Text Fig. 2) differs from the surface of the ground in that the water is not confined to well-defined channels, though there may of course be underground gullies where the water-sheet is thicker. It is very important to understand this concept of the water-table. Almost every miner knows that in similar country he reaches the level where pumping is necessary at about fifty feet; but he remains a believer in the water diviner's prowess in face of his common sense! The region under discussion receives about nineteen

or twenty inches of rain a year, and this is ample to keep the underground waters fresh and flowing. Wells are not usual in such wet regions with sparse settlement, for the few farmers find dams more convenient. But it is infinitely easier to find




VERTICAL SECTION (WEST TO EAST) ACROSS THE EASTERN SIDE OF AINSLIE PLAIN.
SHOWING THE WATER TABLE _____
VERTICAL SCALE / HORIZONTAL = 2/1

FIG. 2.

a supply at Canberra than say in the Tarcoola district (S.A.), where there are, however, many more wells.

The drainage of the Ainslie Valley is normal, reaching the Molonglo by means of Sullivan's Creek, or by the creek from Ainslie (see Text Fig. 1). The slope of the main stream (Sullivan's) is very gradual, dropping only feet between Peden's farm, and the Residency Track. The hill slopes rise fairly suddenly above the 2000 feet contour, and below Majura, there are slopes of 33°. The 2000 feet contour is shown in the plan, and may be taken as near the boundary of the Plain.

I investigated the following wells:—

No. (1) Well at Ainslie.
„ (2) Well in the West.
„ (3) Peden's well in the North.
„ (4) Peden's spring in the North
„ (5) The Engineer's shaft, north of Vernon.
„ (6) The site of a well, east of Crace.

These numbers appear on the map, Text Fig. 1.

### (1) *The Well at Ainslie.*

Early in 1919 the district was short of water, and there was the usual recrudescence of water diviners. Mr. D——— gave his assistance to the owner of Ainslie Well (1). The latter kindly furnished me with full details of the diviner's work, which differs in no particular from the usual procedure.

The diviner used a forked rod[1] of "red gum," cut from the adjacent clump to the north (see map). He tested for water hereabouts, but found none. Then he walked south (see Fig. 1), and the fork began to dip 200 feet away from the old clump. He followed the "flowing stream" towards the old Post Office. It crossed the spur of undecomposed porphyry shown in Plate iv., Fig. 1, and traversed the yard. Here it was said to be confined to a belt of about 100 yards wide, and the diviner advised the owner to sink in the middle of the belt, just where it left his property.

The owner, with great energy and perseverance, sank his well through the decomposed zone fringing the porphyry bluff. I measured the rocks roughly as follows:—

| | | |
|---|---|---|
| Top | 18 | inches grey soil. |
| | 6 | inches ironstone gravel. |
| | 24 | inches clay. |
| | 6 | inches coarse gravel. |
| | 18 | inches clay. |
| | 12 | inches gravel. |
| | 12 | inches clay. |
| | 6 | inches gravel. |
| | 48 | feet decomposed porphyry-tuff. |
| Bottom | 8 | feet less decomposed tuff. |
| Total | 64 | feet. |

A vertical "vein," or crack, with pug, was some assistance in excavating for the lower thirty feet. Great credit is due to the owner for his energy, for the work occupied his spare time for eight months. At fifty-six feet some water came in, giving fifteen gallons by the morning. At sixty-four feet, water was "bubbling in." (See Plate IV., Fig. 2.)

The well supplies from 400 to 800 gallons in twenty-four hours, as far as we could roughly measure it. A 400 gallon tank is filled, and a luxuriant garden is the result of the well.

The diviner had estimated that water would occur about fifty-six feet. The method (as I was told in another case) probably being to *divide the width of the belt by two, and change yards into feet!* i.e., $\frac{112 \text{ yards}}{2} = \text{depth in feet.}$

1 The forked rod used had a butt 2½ inches long and ½ inch diameter. Each leg was 16 inches long and about $\frac{5}{16}$ inch diameter.

*Conclusions:* The owner obviously reached the water-table, which here is determined by the lower boundary of permeable (decomposed) tuff. He has a poor catchment on the slope of the ridge shown in Fig. 1, where the average rainfall is about twenty inches. It is fair to state that the conditions were not very favourable for water, and that one could choose a hundred better places within half a mile. However, they were not on his property!

The chief geological interest in this example lies in the course of the "flowing *stream*." I have already mentioned that definite streams are not to be expected under the conditions obtaining in the Ainslie Valley.

Moreover, the drainage underground must conform with the surface contours in general. In this case the hypothetical "stream" runs perpendicular to a well-defined slope, and right through a ridge of porphyry tuff, whose undecomposed outcrop is visible at the surface! (See line on Plate figures.)

I am of the opinion that as the water table can be reached at from twenty to fifty feet anywhere in this flat, there is no evidence that the diviner exhibited any occult power in this case. Moreover,an analysis shows that the well water is distinctly not potable, while the "flowing *stream*" supplying the well can only be a portion of a sheet of extreme tenuity.

It is of psychological interest that everyone had heard of the Ainslie success (No. 1 on Text Fig. 1), whereas few knew of the next case, that of the well about one mile to the north-west (No. 2 on Text Fig. 1).

### *No. 2 Well.*

The same arid conditions early in 1919 led another settler on the other side of the valley to engage a diviner. Mr. T——— carried out the work. He chose a ridge between two gullies, considerably above the general level of the valley (see map). Here the outcrop was of Silurian clay-slate, with very little surface soil.

The diviner mapped out a "flowing stream," which ran east and west, and again was not in accord with the very definite slopes of the valley.

The "stream" ran from one gully to another, and the owner was advised to sink near the crest of the traverse. He went down thirty-two feet through somewhat decomposed shale, and then about twenty-five feet in hard shale. Apart from a few

damp patches, he saw no water. He "jumped" another twelve feet below the shaft with no result. So that a total of about seventy feet failed to corroborate the diviner. The latter had stated that he was able, by the varying "pressure" on the fork to tell where the water was nearest the surface. This was not in the *gully,* as one would suppose, but on the ridge farther east *on the course* of the "flowing stream." One must therefore postulate that his stream flows upstream, as well as along contours!

It is amusing to note that the settler was drawing water all the time of sinking his own well from the Engineer's shaft (5 on Fig. 1) put down in the middle of the flat, about one and a-half miles to the south. The latter was, I believe, sunk without any assistance from a diviner (or geologist!) merely to find out the character of the strata. It penetrated the water table, and so has had a good supply ever since. (The mouth of this shaft is thickly screened by large ferns.)

I investigated two wells in Mr. Peden's property to the north of the Repatriation areas. The further well (No. 3) was presumably sunk in a very dry season, possibly forty years ago. It had not been needed at a later date, and was filled in when I saw it.

About a quarter of a mile to the south was a spring, which Mr. Peden had floored with large stones. (No. 4 on Fig. 1.) Here he was able to get a plentiful supply for his stock. In very wet seasons it flowed away to the creek, but usually the water was run into a trough by means of a small pump.

This spring is a striking proof of the large water supply in the valley, for it occurs in a flat at a considerable distance from any slopes.

In conclusion, I should like to quote from the "English Mechanic," 11th April, 1913. At Guildford (England) six diviners gave an exhibition before a committee of well-known scientists over ground chosen some time before by the latter.

Site No. (1) (Chosen over a spring): "Most of the diviners missed it."

Site No. (2) (Chosen over a sewer): "All missed it."

Site No. (3) (Grass-covered top of a reservoir): "To see water-diviners walking about a few feet above a mass of water —running water, too—and not being able to detect it, was exquisitely funny." ("Daily Mail" report.)

I believe that much depends on the elasticity of the fork. It is of the nature of a spring, and I feel sure that if the diviner's

hands were fixed so that they *could not move,* outwards or inwards (while still remaining in actual contact with the fork) that many of the results would be unobtainable. It is of interest that I was told of a diviner who was unable to divine after the *loss of his thumb!* This, to me, means that he could not hold his fork firmly.

Three later quotations will surely convince even the most sceptical that the matter concerns the psychologist as an interesting example of "mind influencing matter" (i.e., the muscles), rather than the geologist or farmer.[2]

(*a*) The Commission for Water Conservation and Irrigation in Sydney reports (10th June, 1920):—

"Of fifty-six bores located with the aid of the divining rod seventy per cent. were successful, while, of ninety-six bores sunk without the aid of the divining rod, eighty-seven per cent. were successful. In view of these practical results, it has been decided, after careful consideration, not to make further tests."

(*b*) The Government Geologist of South Australia (L. Keith Ward) reports (5th November, 1914) *inter alia*:—

"It should be apparent to all that the finding of water at a spot 'indicated' by the divining rod constitutes no proof at all of the efficacy of the means of locating the water. It is not sufficient to test only the spots 'indicated.' The area wherein 'no indications' are given by the rod or machine must also be adequately tested before any judgment can be formed. The only test of this character that has, to my knowledge, been carried out in South Australia, is one that was conducted many years ago, on behalf of the South Australian Government, by Mr. T. Parker, in order to test the claims of a man who professed to be able to locate water with the divining rod. The results of this test showed that water existed *throughout* the area in which the experiments were carried out, both at the spots 'indicated,' and in intermediate positions *where no 'indications' were given.*"

(*c*) Finally, the American Geological Survey in 1917 published a report (by A. J. Ellis) containing this summary of the whole matter:—

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2 To my mind this opinion is confirmed by the fact that the divining rod has also been used in all good faith in the past; to detect or locate (1) Ores, (2) Treasure, (3) Lost Landmarks, (4) Criminals, (5) Strayed Animals: and even to cure diseases and analyse personal character (vide Ellis *infra*).

"It is difficult to see how for practical purposes the entire matter could be more thoroughly discredited. To all enquiries the U.S. Geological Survey gives the advice not to expend any money for the services of any 'water witch,' or for the use or purchase of any machine or instrument for locating underground water."

I have to thank the Federal Surveyor-General for the loan of the two maps, prepared partly from my own sketch maps.